TRANSLATION

I, Yuko Mitsui, residing at 4-6-10, Higashikoigakubo, Kokubunji-shi, Tokyo, Japan, state:

that I know well both the Japanese and English languages,

that I translated, from Japanese into English, Japanese Patent Application No. 2002-014559, filed on January 23, 2002, and

that the attached English translation is a true and accurate translation to the best of my knowledge and belief.

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[Name of Item]	Specification	1
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[Document] SPECIFICATION

[Title of the Invention] CHARGE ELIMINATING MECHANISM FOR STAGE AND TESTING APPARATUS

[What is Claimed is:]

[Claim 1] A charge eliminating mechanism for eliminating electrostatic of a stage on which an object to be tested is placed for an electrical characteristic test, the charge eliminating mechanism characterized by comprising: a resistor electrically connected to the stage; and a relay connected to the resistor and grounded.

[Claim 2] A charge eliminating mechanism for eliminating electrostatic of a stage on which an object to be tested is placed for an electrical characteristic test and which is rotatable in forward and reverse directions, the charge eliminating mechanism characterized by comprising a switch for eliminating charge, which mechanically comes into contact with or separates from the stage and grounded.

[Claim 3] The charge eliminating mechanism for a stage according to claim 2, characterized by comprising a resistor between the switch and ground.

[Claim 4] The charge eliminating mechanism for a stage according to claim 2 or 3, characterized by comprising an electric conductor for eliminating charge between the stage and the switch.

[Claim 5] The charge eliminating mechanism for a stage according to any one of claims 2 to 4, characterized in that the switch consists of a contact terminal which elastically comes into contact with or separates from the stage.

[Claim 6] The charge eliminating mechanism for a stage

according to any one of claims 2 to 5, characterized by comprising a charge eliminating plate with spring properties on the stage, the plate elastically coming into contact with the switch.

[Claim 7] A testing apparatus comprising a stage on which an object to be tested is placed for an electrical characteristic test and a rotational drive mechanism to rotate the stage in forward and reverse directions, the apparatus characterized by comprising a switch for eliminating charge, which mechanically comes into contact with or separates from the stage and grounded.

[Claim 8] The testing apparatus according to claim 7, characterized by comprising a resistor between the switch and ground.

[Claim 9] The testing apparatus according to claim 7 or 8, characterized by comprising an electric conductor for eliminating charge between the stage and the switch.

[Claim 10] The testing apparatus according to any one of claims 7 to 9, characterized in that the switch consists of a contact terminal which elastically comes into contact with or separates from the stage.

[Claim 11] The testing apparatus according to any one of claims 7 to 10, characterized by comprising a charge eliminating plate with spring properties on the stage, the plate elastically coming into contact with the switch.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention]

The present invention relates to a charge eliminating mechanism for a stage, and a testing apparatus. More specifically, the present invention relates to a charge eliminating mechanism for a stage, which prevents any damage to an object to be tested in a test, and a testing apparatus.

[0002]

[Prior Art]

A semiconductor manufacturing process has a step of testing a plurality of semiconductor elements (to be referred to as "devices" hereinafter) formed on an object to be tested (e.g., a wafer) using a testing apparatus. As shown in, e.g., FIGS. 3(a) and 3(b), a testing apparatus which performs this step can have a loader chamber 1 to transport wafers W stored in a cassette C one by one, and a prober chamber 2 adjacent to the loader chamber 1 to test the electrical characteristics of the wafers W.

[0003]

As shown in FIGS. 3(a) and 3(b), the loader chamber 1 can have a wafer transporting mechanism 3 which transports the wafers W one by one, and a rough positioning mechanism (to be referred to as a "sub chuck" hereinafter) 4 which aligns the direction of the wafer W transported by the wafer transporting mechanism 3 on the basis of the orientation flat or notch of the wafer W. The loader chamber 2 can have a stage (to be referred to as a "main chuck" hereinafter) 5 which moves in

three-axis directions (X, Y, and Z directions) with the wafer W placed thereon and rotates in the forward and reverse directions along a θ direction, a probe card 6 arranged above the main chuck 5, and a positioning mechanism (to be referred to as an "alignment mechanism" hereinafter) 7 which aligns probes 6A of the probe card 6 and the wafer W on the main chuck 5 with each other. The probe card 6 is fixed to a head plate 8 of the prober chamber 2. A test head T is arranged on the head plate 8 in an electrically connectable state with the probe card 6.

[0004]

When the wafer W is tested, the wafer transporting mechanism 3 picks up the wafer W from the cassette C and places it on the main chuck 5 in the loader chamber 2. While the wafer transporting mechanism 3 transports the wafer W, the wafer W is aligned in a given direction on the sub chuck 4. In the prober chamber 2, the main chuck 5 is moved in the X, Y, and θ directions, so that the wafer W and probes 6A are aligned through the alignment mechanism 7. The main chuck 5 moves in the X and Y directions to position the first device immediately under the probes 6A. After that, the main chuck 5 moves upward in the Z direction, so that the device and the probes 6A are brought into electrical contact with each other, and the device is tested. After the test, the main chuck 5 moves downward, and the main chuck 5 repeats index feeding of the wafer W, so that all devices formed on the wafer W are tested. After the test of wafer W, the wafer W is returned to the original position in the cassette C through the main

chuck 5 and the wafer transporting mechanism 3, and the test of the next wafer W is conducted.

[0005]

Object of the Invention

The main chuck 5, however, is electrostatically charged. This static electricity is transferred to the wafer W on the main chuck 5 as well. Hence, when the device and the probes 6A are to be brought into contact with each other for the purpose of testing the wafer W, arc is generated by discharge between the device and probes 6A. The arc may damage the device. As the devices become very highly integrated and thin, this phenomenon is becoming obvious.

[0006]

The present invention has been made to solve the above problems. It is an object of the present invention to provide a charge eliminating mechanism for a stage, which can prevent any damage to a semiconductor element such as a device even if the semiconductor element is to be highly integrated and thin, and a testing apparatus.

[0007]

[Means for Achieving the Object]

According to the present invention described in claim 1, there is provided a charge eliminating mechanism for eliminating electrostatic of a stage on which an object to be tested is placed for an electrical characteristic test, the charge eliminating mechanism characterized by comprising: a resistor electrically connected to the stage; and a relay connected to the resistor and grounded.

[0008]

According to the present invention described in claim 2, there is provided a charge eliminating mechanism for a stage for eliminating electrostatic of a stage on which an object to be tested is placed for an electrical characteristic test and which is rotatable in forward and reverse directions, the charge eliminating mechanism characterized by comprising a switch for eliminating charge, which mechanically comes into contact with or separates from the stage and grounded.

[0009]

According to the present invention described in claim 3, there is provided a charge eliminating mechanism for a stage according to claim 2, characterized by comprising a resistor between the switch and ground.

[0010]

According to the present invention described in claim 4, there is provided a charge eliminating mechanism for a stage according to claim 2 or 3, characterized by comprising an electric conductor for eliminating charge between the stage and the switch.

[0011]

According to the present invention described in claim 5, there is provided a charge eliminating mechanism for a stage according to any one of claims 2 to 4, characterized in that the switch consists of a contact terminal which elastically comes into contact with or separates from the stage.

[0012]

According to the present invention described in claim 6,

there is provided a charge eliminating mechanism for a stage according to any one of claims 2 to 5, characterized by comprising a charge eliminating plate with spring properties on the stage, the plate elastically coming into contact with the switch.

[0013]

According to the present invention described in claim 7, there is provided a testing apparatus comprising a stage on which an object to be tested is placed for an electrical characteristic test and a rotational drive mechanism to rotate the stage in forward and reverse directions, the apparatus characterized by comprising a switch for eliminating charge, which mechanically comes into contact with or separates from the stage and grounded.

[0014]

According to the present invention described in claim 8, there is provided a testing apparatus according to claim 7, characterized by comprising a resistor between the switch and ground.

[0015]

According to the present invention described in claim 9, there is provided a testing apparatus according to claim 7 or 8, characterized by comprising an electric conductor for eliminating charge between the stage and the switch.

[0016]

According to the present invention described in claim 10, there is provided a testing apparatus according to any one of claims 7 to 9, characterized in that the switch consists of a

contact terminal which elastically comes into contact with or separates from the stage.

[0017]

According to the present invention described in claim 11, there is provided a testing apparatus according to any one of claims 7 to 10, characterized by comprising a charge eliminating plate with spring properties on the stage, the plate elastically coming into contact with the switch.

[0018]

[Embodiment of the Invention]

The present invention will be described hereinafter with reference to the embodiment shown in FIGS. 1 and 2. As shown in FIG. 1, a testing apparatus 10 according to this embodiment is formed in the same manner as a conventional testing apparatus, except for a charge eliminating mechanism 20 (main chuck) for a stage of this embodiment. Hence, the charge eliminating mechanism 20 of the present embodiment will mainly be described. A main chuck 11 can have a chuck top 11A where a wafer is placed. The main chuck can be rotated in the forward and reverse directions by a rotational drive mechanism (not shown). The chuck top 11A and the wafer placed on the chuck top 11A are statically charged. For this reason, when testing the wafer, the static electricity may damage the device.

[0019]

According to this embodiment, when the wafers are exchanged, the static electricity of the chuck top 11A is eliminated by the charge eliminating mechanism 20 of this embodiment. As shown in FIG. 1, the charge eliminating

mechanism 20 according to this embodiment has a contact terminal for eliminating charge (for example, a POGO pin) 21 serving as a switch, a charge eliminating block 22 connected electrically conductive with the POGO pin 21 and made of a conductive metal, and a resistor 23 electrically connected to the charge eliminating block 22 and grounded. The charge eliminating plate 24 is electrically connected to the outer surface of the chuck top 11A. An end 24A of the charge eliminating plate 24 projects outward from the chuck top 11A. The charge eliminating plate 24 is made of a conductive metal and has spring properties, and arranged to come into contact with and separate from the POGO pin 21.

[0020]

The POGO pin 21 is separated from the charge eliminating plate 24 when it eliminates charge of the chuck top 11A, with the switch mechanically being OFF. The charge eliminating block 22 eliminates the static electricity of the chuck top 11A at once through the charge eliminating plate 24 and the POGO pin 21 in an ON state, and temporarily stores this static electricity. The resistor 23 prevents the static electricity stored in the charge eliminating block 22 from being abruptly discharged. Thus, the POGO pin 21 comes into contact with the end 24A of the charge eliminating plate 24, eliminates the static electricity of the chuck top 11A at once, stores the static electricity in the charge eliminating block 22, and gradually discharges the static electricity to ground through the resistor 23.

[0021]

Next, operation of the apparatus will be described. The wafer on the chuck top 11A is tested in the same manner as in the conventional case, and the wafer on the chuck top 11A is unloaded from the prober chamber with a wafer transporting mechanism (not shown). Before receiving the next wafer, the main chuck 11 rotates, to eliminate the static electricity of the chuck top 11A through the charge eliminating mechanism 20.

[0022]

In other words, when the main chuck 11 rotates, in the charge eliminating mechanism 20, the end 24A of the charge eliminating plate 24 and the POGO pin 21 elastically come into contact with each other. Hence, by spring force, the charge eliminating plate 24 partly separates from the outer surface of the chuck top 11A, and the POGO pin 21 contracts. The chuck top 11A and the POGO pin 21 electrically connected with each other through the charge eliminating plate 24, with the switch turned ON. In this state, the static electricity that charges the chuck top 11A flows to the charge eliminating block 22 at once through the charge eliminating plate 24A and POGO pin 21, and consequently the static electricity is eliminated from the chuck top 11A. The static electricity of the charge eliminating block 22 flows to ground through the resistor 23, and consequently the static electricity is eliminated from the charge eliminating block 22. Subsequently, the main chuck 11 rotates in the reverse direction so that the POGO pin 21 separates from the end 24A of the charge eliminating plate 24. Consequently, the switch is mechanically turned off, and the

chuck top 11A is electrically isolated from charge eliminating mechanism 20.

[0023]

After the chuck top 11A is statically discharged, the wafer transporting mechanism places the next wafer onto the chuck top 11A. Subsequently, the alignment mechanism aligns the wafer on the main chuck 11 and the probes, and each device is tested. In this case, the wafer is not electrically charged because static electricity has been eliminated from the chuck top 11A. Therefore, even if any probe comes into contact with a device on the wafer, no arc is generated by electric discharge, so that the device is prevented from being damaged, thus preventing a decrease in yield of the devices. Since the POGO pin 21 of the charge eliminating mechanism 20 mechanically separates the chuck top 11A and electrically isolated, the current does not leak from the chuck top 11A during testing. As a result, stable, reliable testing can be conducted.

[0024]

As described above, according to this embodiment, the testing apparatus 10 includes the charge eliminating mechanism 20 having a POGO pin that mechanically comes into contact with and separates from the chuck top 11A and grounded. Thus, it is possible to eliminate the static electricity built on the chuck top 11A using the charge eliminating mechanism 20 when the wafers are exchanged. In testing, arc caused by electric discharge between the wafer and probes is prevented, so that any damage to the wafer can be prevented. Further, since the resistor 23 is formed between the POGO pin 21 and ground,

abrupt discharge of the static electricity can be avoided. In addition, since the charge eliminating block 22 is formed between the chuck top 11A and POGO pin 21, the static electricity of the chuck top 11A can instantaneously be eliminated. Moreover, since the POGO pin 21 having a small pressing force is used as the switch, the mechanical load on the chuck top 11A can be reduced.

[0025]

FIG. 2 is a conceptual view showing a charge eliminating mechanism according to another embodiment of the present invention. As shown in FIG. 3, the charge eliminating mechanism 30 of the present embodiment has a resistor 31 connected to a chuck top 11A, and a relay 32 grounded and connected to the resistor 31. When wafers W are exchanged, the relay 32 is electronically turned on, as indicated by a broken line, so that the static electricity of the chuck top 11A is eliminated. As the charge eliminating mechanism 30 of the present embodiment uses the relay 32 differently from the above-described embodiment, sometimes a current on the order of picoampere leaks. For this reason, when a small current on the order of picoampere is measured during testing, the stability of the test may be interfered with, otherwise, there is no problem for the test. According to the present embodiment, as shown in FIG. 2, also in a testing state in which probes 12A of a probe card 12 are in contact with the wafer W, the resistor 31 is connected to the chuck top 11A. Thus, during testing, the resistor 31 picks up noise while serving as an antenna, which may undesirably interfere with the stability of the test

performed by a tester 13. Since the charge eliminating mechanism requires a power supply for driving the relay 32, it has a somewhat complicated structure. Although the charge eliminating mechanism 30 according to the present embodiment may have some problems in this manner, as long as a small current is not measured, testing can be conducted without any trouble such as damage to the wafer. In this respect, the charge eliminating mechanism 20 according to the above embodiment does not have such a problem as the charge eliminating mechanism 30 according to the present embodiment has, and a test excellent in stability can be conducted.

[0026]

The present invention is not limited to the above embodiments, but the respective constituent elements may be appropriately changed in design when necessary. For example, the charge eliminating mechanism 20 of the above embodiment has the charge eliminating block 22 and resistor 23 between the POGO pin 21 and ground. The static electricity of the chuck top 11A can be eliminated without the charge eliminating block 22 and resistor 23. Alternatively, no charge eliminating plate 24 need be provided, and the chuck top 11A may be moved in the X and Y directions, so that the chuck top 11A can be brought into direct contact with the POGO pin 21.

[0027]

[Advantage of the Invention]

According to the present invention described in claims 1 through 11, a charge eliminating mechanism for a stage, which can prevent any damage to a semiconductor element such as a

device even if the semiconductor element is to be highly integrated and thin, and a testing apparatus.

[Brief Description of the Drawings]

[FIG. 1]

A conceptual view showing a charge eliminating mechanism according to an embodiment of the present invention.

[FIG. 2]

A conceptual view showing a charge eliminating mechanism according to another embodiment of the present invention.

[FIG. 3]

Views showing an example of conventional testing apparatus, in which FIG. 3(a) is a side view showing the interior of the testing apparatus, and FIG. 3(b) is a plan view of FIG. 3(a).

[Explanation of Reference Symbols]

10: Testing apparatus

11: Main chuck (stage)

11A: Chuck top (stage)

20, 30: Charge eliminating mechanism

21: POGO pin (contact terminal)

22: Charge eliminating block (electric conductor for eliminating charge)

23, 31: Resistor

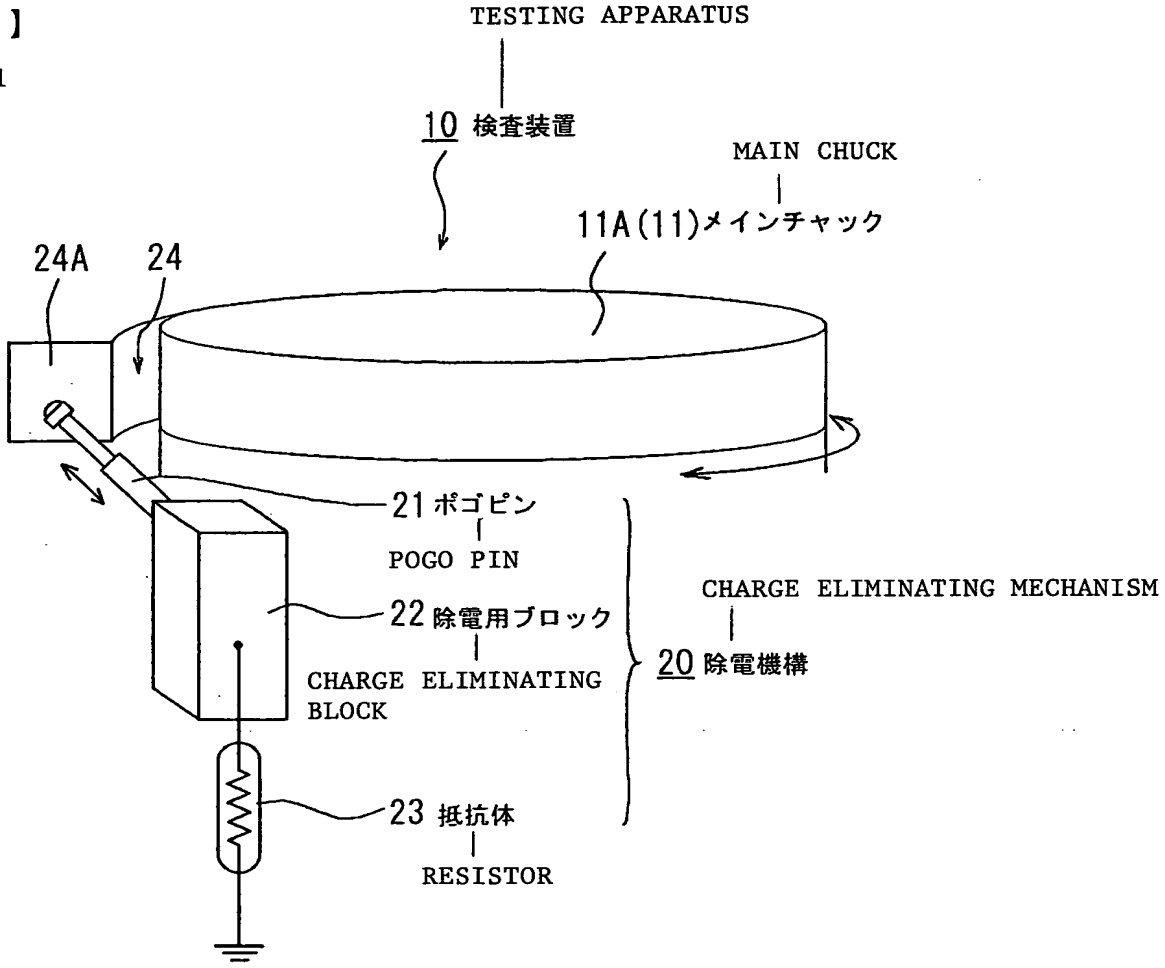
32: Relay

NAME OF DOCUMENT

【書類名】図面 DRAWINGS

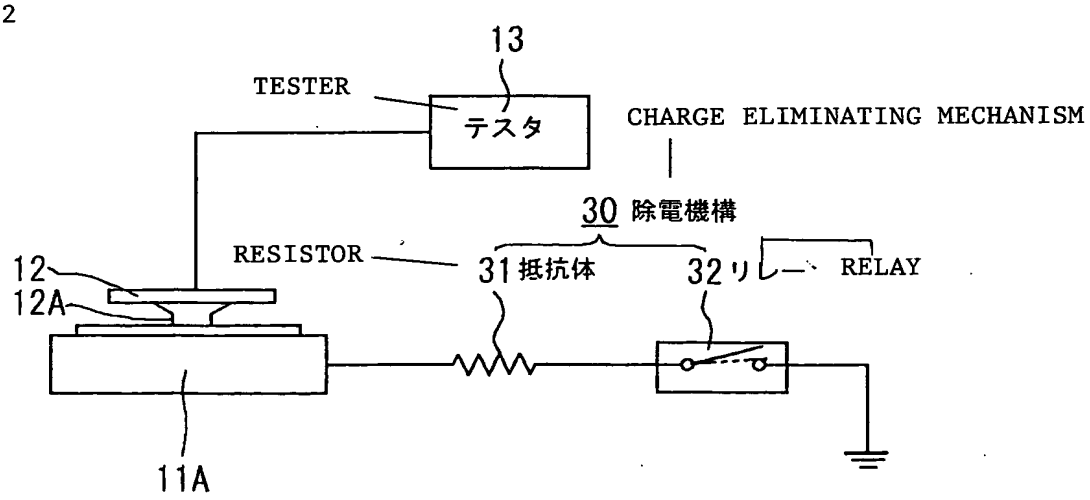
【図１】

FIG. 1



【図２】

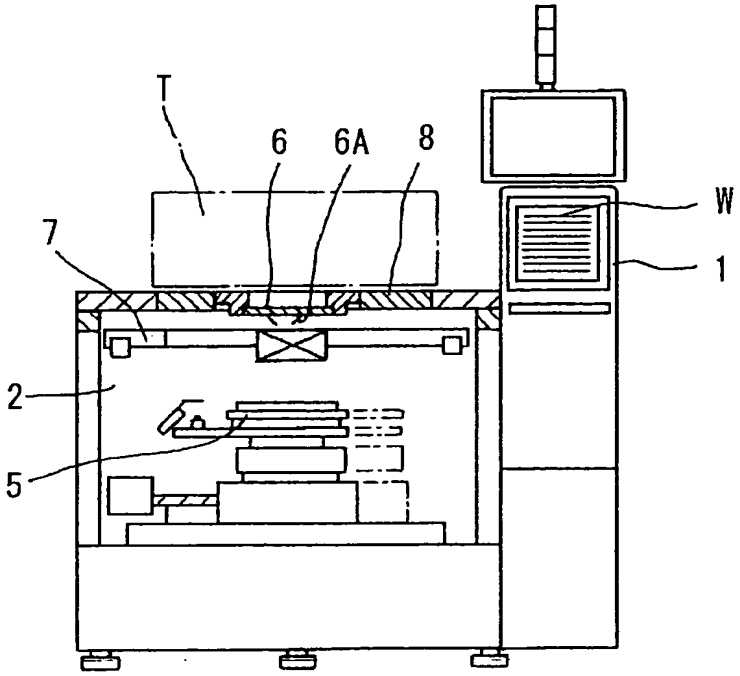
FIG. 2



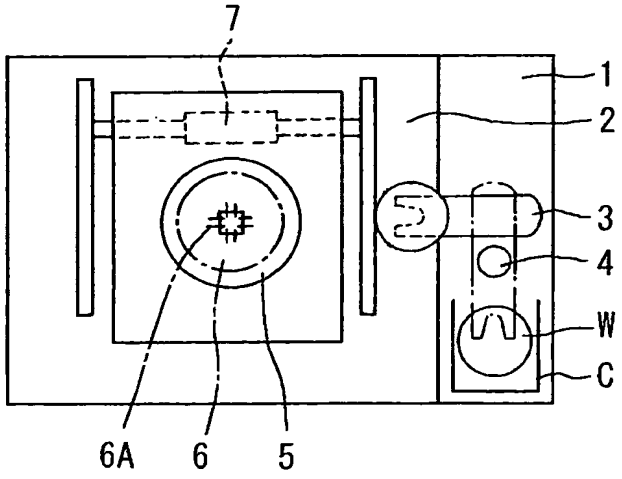
【図３】

FIG. 3

(a)



(b)



[Document] ABSTRACT

[Abstract]

[Object] A main chuck 5 is electrostatically charged. This static electricity is transferred to a wafer W on the main chuck 5 as well. Hence, when a device and probes 6A are to be brought into contact with each other for the purpose of testing the wafer W, arc is generated by discharge between the device and probes 6A, which may damage the device.

[Means for Achieving the Object] A charge eliminating mechanism 20 of the present invention comprises: a contact terminal for eliminating charge (for example, a POGO pin) 21 serving as a switch; a charge eliminating block 22 connected electrically conductive with the POGO pin 21 and made of a conductive metal; and a resistor 23 electrically connected to the charge eliminating block 22 and grounded.